

WHAT IS CLAIMED IS:

1. A dispersion-compensating module for compensating cumulative dispersion and dispersion slope of a transmission optical fiber in a predetermined signal wavelength band including at least 1530 to 1625 nanometers, comprising:
 - a first dispersion-compensating fiber having a negative first dispersion value and a negative first dispersion slope;
 - a second dispersion-compensating fiber having a negative second dispersion value and a negative second dispersion slope, the second dispersion value and the second dispersion slope being different from the first dispersion value and the dispersion slope respectively; and
 - a jointing unit that serially joints the first dispersion-compensating fiber with the second dispersion-compensating fiber, wherein the first dispersion slope changes along an upwardly convex curve as the wavelength changes, and the second dispersion slope changes along a downwardly convex curve as the wavelength changes.
2. The dispersion-compensating module according to claim 1, wherein the first dispersion-compensating fiber and the second dispersion-compensating fiber are wound around a bobbin.
3. The dispersion-compensating module according to claim 1, wherein

a dispersion-compensating fiber having a smaller bending loss in a maximum wavelength of the predetermined signal wavelength band is first wound around the bobbin.

5 4. The dispersion-compensating module according to claim 1, wherein

the first dispersion compensation fiber and the second dispersion compensation fiber are jointed to each other by fusion.

10 5. The dispersion-compensating module according to claim 4, further comprising a protection unit around the jointing unit.

6. The dispersion-compensating module according to claim 5, wherein the protection unit includes ultraviolet cured resin.

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7. The dispersion-compensating module according to claim 1, wherein

a dispersion value D_t [ps/nm/km] of the dispersion-compensating module at a center wavelength in the predetermined signal wavelength band satisfies an inequality of $D_t \leq -20$.

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8. The dispersion-compensating module according to claim 1, wherein

25 at the center wavelength in the predetermined signal wavelength

band, a ratio of a dispersion value D_t [ps/nm/km] to a dispersion slope S_t [ps/nm²/km], that is, D_t/S_t , of the dispersion-compensating module and a ratio of a dispersion value D_0 [ps/nm/km] to a dispersion slope S_0 [ps/nm²/km], that is, D_0/S_0 , of the transmission optical fiber satisfy an inequality of

$$0.9 \times (D_0/S_0) \leq D_t/S_t \leq 1.1 \times (D_0/S_0).$$

9. The dispersion-compensating module according to claim 1, wherein

10 a ratio of the first dispersion value, D_1 , to the first dispersion slope, S_1 , and a ratio of a dispersion value D_0 [ps/nm/km] to a dispersion slope S_0 [ps/nm²/km] of the transmission optical fiber satisfy an inequality of

$$0.8 \times (D_0/S_0) \leq D_1/S_1 < D_0/S_0$$

15 and

a ratio of the second dispersion value, D_2 , to the second dispersion slope, S_2 , and the ratio D_0/S_0 satisfy an inequality of

$$D_0/S_0 < D_2/S_2 \leq 1.2 \times (D_0/S_0).$$

20 10. The dispersion-compensating module according to claim 1, wherein

an absolute value of a cumulative dispersion value of the transmission optical fiber after a compensation by the dispersion-compensating module at the center wavelength in the predetermined signal wavelength band is equal to or less than 0.5 ps/nm/km, and an

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absolute value of a cumulative dispersion slope of the transmission optical fiber is equal to or less than $0.01 \text{ ps/nm}^2/\text{km}$.

11. The dispersion-compensating module according to claim 1,
5 wherein

an absolute value of a cumulative dispersion value of the transmission optical fiber after a compensation by the dispersion-compensating module in the predetermined signal wavelength band is equal to or less than 0.5 ps/nm/km , and an absolute
10 value of a cumulative dispersion slope of the transmission optical fiber equal to or less than $0.01 \text{ ps/nm}^2/\text{km}$.

12. The dispersion-compensating module according to claim 1,
wherein
15 at least one of the first dispersion-compensating fiber and the second dispersion-compensating fiber has a function to be equipped with Raman amplifier.

13. An optical transmission system comprising at least the
20 dispersion compensation module according to claim 1.